REMARKS/ARGUMENTS

Claims 1-10 and 15-23 are pending in this application.

Applicants appreciate the Examiner's indication that claims 15-23 are allowed, and that claim 3 would be allowable if rewritten in independent form including all of the features of the base claim and any intervening claims.

Claims 1, 2, and 4-10 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Khan et al. (US 2002/0109226). Applicants respectfully traverse the prior art rejection of claims 1, 2 and 4-10.

Claim 1 recites:

> "A cavity-down ball grid array package comprising:
> a flexible circuit tape including a flexible tape laminated to a conductor layer, the flexible circuit tape having an aperture therein;
> a thermally conductive heat spreader directly fixed to a first surface of the flexible circuit tape, the heat spreader having a cavity aligned with the aperture of the flexible circuit tape;
> a semiconductor die mounted to the heat spreader, in a die-down configuration in said cavity;
> a thermally conductive die adapter fixed to said semiconductor die such that a portion of said die adapter protrudes from said cavity;
> a plurality of wire bonds connecting said semiconductor die to bond sites on said second surface of said flexible circuit tape;
> an encapsulating material encapsulating said semiconductor die and said wire bonds; and
> a plurality of solder balls disposed on a second surface of the flexible circuit tape, in the form of a ball grid array,
> wherein **the die adapter is comprised of one of silicon and silicon coated with a solderable layer.**" (emphasis added)

The Examiner alleged that Khan et al. teaches all of the features recited in Applicants' claim 1, except for the feature of the die adapter being made of silicon or silicon coated with a solderable layer. The Examiner further alleged that that it would have been obvious to one of ordinary skill in the art at the time the invention was made to use silicon for the die adapter as this would be a matter of obvious design choice.

In the Amendment filed on January 17, 2005, Applicants argued that Khan clearly fails to teach or suggest that the die adapter is made of silicon. The Examiner now alleges that Khan et al. teaches "that a thermally conductive die adapter is made of polymer (paragraphs 0031 and 0039), wherein elements in polymeric material includes carbon, nitrogen, oxygen, fluorine and silicon (according to material handbook)." Applicants respectfully disagree.

In contrast to the Examiner allegations, Khan et al. not only fails to teach or suggest that the die adapter is made of silicon or silicon coated with a solderable layer, but in fact, Khan et al. teaches away from the use of a die adapter made of silicon or silicon coated with a solderable layer. In paragraph 0031, Khan et al. discloses that "[p]referably, the package stiffener/heat spreader is manufactured from the same material as the drop-in heat spreader. In such an arrangement, the package stiffener/heat spreader-to-IC die-to-drop-in heat spreader combination will not bend significantly with a change of temperature. This is because with temperature changes, both heat spreaders will bend towards or away from the IC die, essentially canceling each other's bending motion". In paragraph 0039 Khan et al. teaches that "Stiffener 110 is typically made from a metal, or combination of metals, such as copper, tin, and aluminum, or may be made from a polymer, for example."

Thus, paragraphs 0031 and 0039 of Khan et al. clearly and specifically disclose that the package stiffener/heat spreader 110 is manufactured from **the same material as the heat spreader 202**. The suggested materials for the package stiffener/heat spreader 110 are metals, a combination of metals, or a polymer. There is absolutely no teaching or suggestion in Khan et al. of using silicon for the package stiffener/heat spreader 110. Since the heat spreader 202 is made from the same material as the package stiffener/heat spreader 110, it is clear that the heat spreader 202 must also be made from metal, a combination of metals, or a polymer. Thus, Khan teaches away from the use of silicon since it is desirable to manufacture the heat spreader 202 from the same material as the package stiffener/heat spreader 110.

The Examiner is reminded that it is error to find obviousness where references diverge and teach away from the invention at hand. W.L. Gore & Assoc. v. Garlock Inc., 220 USPQ 303, 311 (Fed. Cir. 1983).

With respect to the Examiner's allegation that Khan et al. teaches that a thermally conductive die adapter is made from polymer, wherein elements in polymeric material include carbon, nitrogen, oxygen, fluorine and silicon, the Examiner appears to be alleging that a polymer could include silicon. However, the Examiner is clearly misconstruing the terms recited in Applicants' claim 1. One with any knowledge of material science would understand that a polymer is a material composed of long-chain or networked molecules. Silicon, on the other hand, is a semiconductor element and is not composed of long-chain or networked molecules, as is the case in the polymer. The fact that Khan et al. teaches the use of a polymer is not equivalent to and does not obviate the use of silicon or silicon coated with a solderable layer for the heat spreader.

With respect to the Examiner's assertion that it is within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use is a mater of obvious design choice, Khan et al. specifically limits the materials used for the heat spreader 202 by indicating that the material of the heat spreader 202 is the same as the package stiffener/heat spreader 110 which is made from metals, a combination of metals, or a polymer. It is therefore not an obvious design choice to choose to use silicon as the heat spreader 202 since Khan et al. specifically teaches that the heat spreader 202 is made of the same material as the package stiffener/heat spreader 110 which is made of metals, a combination of metals, or polymer.

In addition, the Examiner is reminded that the U.S. Patent Office Board of Patent Appeals and Interferences has concluded that a rejection on the basis of design choice is clearly improper. In re Garrett, Appeal No. 580-81 (BPAI 1986) (wherein in reversing an obviousness rejection, the Board criticized that the Examiner's statement that the proposed modification would have been an obvious matter of engineering design choice with the explanation that such an assertion is a conclusion, not a reason). Further, the